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THE AMERICAN VARIETIES OF *RORIPPA ISLANDICA**

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In 1928 Fernald[1] pointed out the differences between the Old World *Rorippa islandica* (Oed. ex Murr.) Borbás (*R. palustris* (L.) Bess.)[2] and the common American plant which had been passing as *R. palustris*. At the same time he took up for the latter plant the name *Rorippa hispida* var. *glabrata* Lunell.[3] Two years later Marie-Victorin[4] interpreted Lunell's variety in the same sense. He differed from Fernald, however, in his views of the specific limits within this group, and accordingly published the new combination *Rorippa palustris* var. *glabrata* (Lunell) Vict.

Recently, an attempt to clear up the identity of certain Minnesota specimens belonging to the *Rorippa islandica* complex led us to an

* Contribution from the Herbarium of the University of Minnesota.

[1] See M. L. Fernald, Rhodora xxx. 131 (1928).

[2] In the paper cited above Fernald maintained the name *Rorippa islandica* for the European plant. Later (Rhodora xxxi. 17, 1929) he withdrew this name on the ground that the combination *Sisymbrium islandicum* Oeder, Fl. Dan. Tab. 409 (1768), upon which it is based, was not validly published. This combination was, however, validated by J. A. Murray in a paper in the *Novi Commentarii societatis regiae scientiarum Gottingensis* iii. p. 81 (1773). Murray attributes the combination *Sisymbrium islandicum* to Oeder, quotes Oeder's doubtful diagnosis, "Sisymbrium (islandicum ?) siliquis brevibus" etc. and then discusses Oeder's question as to whether the plant might be only a variety of *S. sylvestris*. His final conclusion, "Ob hasce notas, quae junctae nec in aliam Sisymbrii speciem quadrant, singularem ea constitui debere speciem arbitror," is perfectly definite. Murray's paper was presented July 4, 1772 but the date on the title page of the volume of *Commentarii* for 1772 is 1773, and the preface is dated April 20 of that year. This still leaves the date of the valid publication of *Sisymbrium islandicum* four years ahead of Pollich's *S. palustris*. Apparently the valid name of the species is *Rorippa islandica* (Oeder ex Murray) Borbás (see Rhodora xxxi. 18).

[3] J. Lunell, Bull. Leeds Herb. no. 2: 6. (1908).

[4] Frère Marie-Victorin, Le genre Rorippa dans le Québec. Contrib. Lab. Bot. Univ. Montréal no. 17: 15 (1930).

examination of Lunell's type of "*Roripa hispida* var. *glabrata*," now in the Herbarium of the University of Minnesota. To our surprise it proved to be not the common narrow-podded glabrous plant of eastern North America, but quite a different plant with unusually large, short-ellipsoid pods and nearly entire upper leaves (see PLATE 588).

Lunell's original description is extremely brief: "**RORIPA HISPIDA** (**DESV.**) **BRITTON**, var. **GLABRATA LUNELL**, n. var. The whole plant shining, glabrous. Occasionally among the main form." Incidentally not one of the four plants on his type sheet (clearly designated as such) is wholly glabrous. One of them is nearly so, though with about a dozen bristly hairs just below the inflorescence, while the other three are sparingly hispid throughout the upper half of the stem and on the auricles and midribs of the leaves. The plants appear to have been partly flooded earlier in the season (there was a piece of *Lemna trisulca* entangled among the roots of one of them), and are entirely denuded of leaves for 15–20 cm. at the base. All but one of the leaves present are rhombic-lanceolate or narrowly elliptic, rounded at the apex, nearly entire, slightly sinuate, or occasionally with one or two poorly marked teeth toward the base. The single exception, the lowest leaf still present on one of the plants, though only $2\frac{1}{2}$ cm. long, including the petiole, has two fairly marked, rounded teeth on each side toward the base and a spatulate terminal lobe.

It is to be noted that at the time that Lunell described this variety he was collecting both of the common eastern varieties and was naming them "Roripa palustris" and "Roripa hispida" respectively, and he evidently thought of his new variety as a glabrous form of the latter, which is evidently very close to its true status. We should be inclined to relegate it to the status of a form but for the following considerations: First, it seems to have a geographical distribution of its own. While it apparently does not occur at all in the eastern range of *Rorippa islandica* var. *hispida*[1] it is of wide distribution in the far west, though judging from the small number of specimens, it is far from common. Aven Nelson's *Roripa terrestris globosa* was founded on essentially similar specimens from Idaho and Wyoming. We have

[1] RORIPPA ISLANDICA var. **hispida,** comb. nov., *Brachilobus hispidus* Desv., Journ. Bot. iii. 183 (1814), *Nasturtium palustre* var. *hispidum* (Desv.) Gray, Man. ed. 2, 30 (1856).

We are following essentially the specific concept of Marie-Victorin (loc. cit.). Our reasons will be discussed later in this paper. We introduce this note here to avoid misunderstanding or unnecessary circumlocution in speaking of the various entities.

examined a sheet of his type number, and it agrees closely with Lunell's type, though the siliques are somewhat smaller and rounder, and the leaves a little more toothed.

Second. The foliage of the Lunell plant does not appear to owe its peculiarities entirely to the aquatic habitat. We have seen a specimen from New Mexico (*A. A. and E. Gertrude Heller* 3743, Santa Fe, June 22, 1897), evidently not aquatic, which has several of the basal leaves present. They are moderately pinnatifid with 2 or 3 pairs of small, oblong, round-tipped basal lobes and a large, rhombic, crenately toothed terminal lobe. From about the middle of the plant upward the leaves in this as in the Lunell plants are almost entire.

Third. Lunell's description of the plant as "shining" is hardly obvious in dried specimens, but all the specimens which we have seen have thickish leaves (probably somewhat fleshy in life) with unusually plane surfaces, and obscure lateral veins. They may well have been "shining" in the living condition.

Fourth. Most of the specimens of this entity have a large number of tricarpellate and tetracarpellate siliques. This is the abnormality which led Turczaninow to describe a new genus, Tetrapoma, for certain related Asiatic forms. It is very common in the long-podded *R. islandica* var. *occidentalis*[1] of the north Pacific coast and is reported by Busch as common in the Siberian plants which he calls "*Nasturtium hispidum* f. *Tetrapoma*,"[2] but we have not noted it in our ordinary eastern *R. islandica* var. *hispida*.

For these reasons Lunell's plant seems to be sufficiently distinct from var. *hispida* to be treated as a distinct though closely related variety. As far as American plants are concerned, Lunell's varietal name seems to be the oldest. Some of the fruits of Siberian plants figured by Busch[3] under the name "*Nasturtium palustre* var. *microcarpum* Rgl." are very similar to those of var. *glabrata* and the plants are described as glabrous. This combination, published, according

[1] Rorippa islandica var. **occidentalis** comb. nov., *Nasturtium terrestre* var. *occidentale* S. Wats. in Gray, Synoptical Flora i. 148 (1895); *Roripa pacifica* Howell, Fl. Northwest Am. 40 (1903); *Rorippa palustris* var. *pacifica* G. N. Jones, Univ. Wash. Publ. Biology v. 161 (1936).

Howell's *R. pacifica* was based directly on Watson's variety. Though Howell does not mention it, his change in the name was undoubtedly due to the fact that the name *R. occidentalis* was preoccupied by a Californian species. If treated as a variety of *R. islandica*, however, there is no bar to the use of Watson's varietal name and it should be restored.

[2] N. Busch. Flora Siberiae et orientis extremi, xxv. Cruciferae. 207. (1915).

[3] N. Busch, loc. cit., p. 202. However the stigmas shown in Busch's drawings are more capitate than those of our plant.

to Busch in 1861, of course greatly antedates Lunell's, but from the very meager information available it is impossible to say whether the plants are in all respects identical. It seems best therefore for the present to retain Lunell's varietal name for the west American plant as follows:

RORIPPA ISLANDICA var. **glabrata,** comb. nov. *Rorippa hispida* var. *glabrata* Lunell, Bull. Leeds Herb. no. 2: 6 (1908). *Rorippa palustris* var. *glabrata* (Lunell) Victorin, loc. cit. p. 15 as to name only. *Roripa terrestris globosa* A. Nels., Bot. Gaz. 52: 264 (1911).—North Dakota to Idaho, south in the Rocky Mountains to New Mexico. The following specimens have been seen: NORTH DAKOTA: Leeds, Benson Co., July 1, 1907, *J. Lunell* (TYPE); same place and collector, July 22, 1909 and July 27, 1909. IDAHO: Falk's Store, Canyon Co., July 22, 1910, *J. F. Macbride*, no. 275 (type collection of *Roripa terrestris globosa*); Twin Falls and Shoshone Falls, July 25, 1911, *A. Nelson and J. F. Macbride*, no. 1318. NEW MEXICO: Santa Fe, June 22, 1897, *A. A. and E. Gertrude Heller*, no. 3743.

This disposition of *R. hispida* var. *glabrata* Lunell leaves our common North American glabrous plant with narrow pods without a name, and we are proposing to call it *Rorippa islandica* var. *Fernaldiana*[1] after Professor M. L. Fernald who first definitely pointed out the distinctions between this and the European form of the species.

To the differences pointed out by Fernald may be added that the silique in this American plant is frequently narrowly ovoid rather than elliptic-cylindric, and that it averages 2.6 times as long as wide, while the well-developed lower siliques of European plants average 3.6 times as long as wide (the upper siliques in any given inflorescence are apt to be somewhat shorter), more nearly cylindric, and often a little falcate.

In regard to the specific or varietal character of these differences there is certainly room for difference of opinion. In 1928 Fernald treated the American plants as varieties of one species, and the European (occurring also sparingly in northeastern North America) as another. Two years later Marie-Victorin treated them all as varieties and forms of a single species. Similar disagreement is found in recent treatments of Asiatic forms. Thus Busch[2] maintains in

[1] RORIPPA ISLANDICA var. **Fernaldiana,** nom. nov. Planta glabra vel fere glabra, plerumque crassa, foliis haud tenuibus, iis inferioribus lyrato-pinnatifidis vel crasse pinnatim dentatis praesertim ad basin, lobo terminali ovato majore, iis superioribus minus dentatis vel subintegris; siliquis longe ellipsoideis vel ovoideis, ca. 2.5-plo longioribus quam latis.—*Roripa hispida* var. *glabrata* Fernald, loc. cit., p. 133, not Lunell. *Rorippa palustris* var. *glabrata* Victorin, loc. cit., p. 15, as to the plant described, not as to the name-bringing synonym.

TYPE in Herb. Minn., Wet places, Ft. Fairfield, Maine. *M. L. Fernald*, July 6, 1893.

[2] N. Busch, loc. cit. pp. 201–209 (1915).

Siberia "*Nasturtium palustre*" with a var. *genuinum* (long-podded) and a var. *microcarpum* (short-podded) and "*Nasturtium hispidum*" with two forms, while Hultén[1] regards them all as varieties of "*Nasturtium palustre.*" It seems that the exact relation of the plants of this intricate plexus can only be settled by some one who has access to large collections of specimens from various parts of both hemispheres and who is also willing to grow the various forms experimentally and thus eliminate the large ecological differences which undoubtedly occur within each of the genetic categories.

Specifically, what is the behavior of these plants in eastern Siberia between Lake Baikal and the Pacific where typical *Rorippa islandica* and var. *hispida* both occur? The figures of the two plants in Busch's treatment show the same differences in leaf form that obtain between European and North American plants of these entities, but do they maintain these differences consistently? At least we know that the fruit distinctions break down in that region, for Busch's figures of the fruits of the glabrous "*Nasturtium palustre* var. *microcarpum* Rgl." are very similar to the fruits of American var. *hispida.*

Another reason for treating all these entities as varieties of a single species is that a certain number of specimens appear in a large collection which do not fit well into any of the described forms, and often combine the characters of two or more of them. This seems more consistent with the view that the whole plexus forms a single polymorphic species. Some of these peculiar forms rather suggest hybrids, but the requisite parents have the disconcerting habit of being half the world away, and it seems more probable that they represent merely unusual genetic combinations, possibly separation of usually linked genes, or expression of recessive characters that are submerged in nearly all the members of the local population.

It may be well to describe a few of these unusual specimens that we have noted:—

1. A plant collected by *Chas. C. Deam*, at Vanemons Pond, Wells Co., Ind. July 8, 1900. The leaves, both basal and upper, are essentially like those of European *R. islandica* including their thin texture, but the whole plant is strongly hispid. The pods are variable, some of them resembling var. *hispida*, others var. *Fernaldiana.*

2. Two collections from the central Rocky Mountain region: *Aven Nelson* 1415, Pole Creek, Wyoming, and *Marcus E. Jones* 505, Georgetown, Colo. In both of these the leaves are quite as thin as in any

[1] Eric Hultén, Flora of Kamtchatka and the adjacent islands. ii. 150 (1928).

European plant, but in other respects the plants are quite typical var. *Fernaldiana*. The Wyoming specimen is in flower only, the Colorado one in nearly mature fruit.

3. A plant from Portland, Oregon (*E. P. Sheldon*, no. 10972) with the foliage of the European type and the fruits of var. *hispida*. The whole plant is glabrous except for a very few hispid hairs on the auricles of the lower leaves.

4. A Minnesota plant from recently filled-in ground adjacent to Duluth harbor (*Olga Lakela*, no. 1501, July 9, 1936). The foliage is essentially that of var. *Fernaldiana*, the siliques are those of var. *glabrata* or in some cases intermediate between the latter and the Pacific coast var. *occidentalis*. Like both of these varieties it has numerous tricarpellate siliques. Its seeds are 0.9 mm. long, a size met elsewhere only in var. *glabrata*. From its habitat this plant is probably an introduction, or possibly a hybrid between introduced var. *glabrata* and the native var. *Fernaldiana*.

In making this study certain taxonomic criteria have been tested and it seems desirable to put on record briefly the results obtained.

SIZE AND SHAPE OF PODS: Absolute size of pods has very little significance except in certain extreme forms. The shape, reduced to a ratio $\frac{\text{Length}^1}{\text{Width}}$, is much more significant, and serves about as well to separate typical *R. islandica* from var. *Fernaldiana* as to separate the latter from var. *hispida*. In each case there is a certain amount of overlap. In this respect var. *glabrata* is very similar to var. *hispida*. The data are summarized in the following table:

	No. specs. m's'd	Pod length (mm.)		Pod width (mm.)		Pod length / Pod width	
		Aver.	Extremes	Aver.	Extremes	Aver.	Extremes
European							
R. ISLANDICA	14	6.8	4.2–10.7	1.9	1.3–2.4	3.6	3.1–5.5
var. FERNALDIANA	42	4.3	3.0– 6.4	1.6	1.2–2.5	2.6	2.0–3.4
var. HISPIDA	24	3.4	2.2– 4.6	2.1	1.7–2.8	1.6	1.1–2.2
var. GLABRATA	13	4.8	2.8– 5.5	2.7	1.9–3.7	1.8	1.3–2.9

LENGTH OF STYLE: In this character each variety shows certain tendencies, but there is so much overlapping that this character is far from diagnostic. It is apparently a genetic character, and is very uniform for each individual. In var. *Fernaldiana*, the length of the style is moderately variable (0.2) 0.3–0.6 (0.7) mm., with a quite normal distribution about the mean length of 0.5 mm. In each of the

[1] Length of pod was measured exclusive of the style.

other American varieties there is a tendency toward a bimodal curve, some plants being distinctly short-styled and others long-styled. Thus in var. *hispida* about a third of the plants examined have style-lengths of 0.45–0.50 mm., a slightly larger group have style-lengths of 0.7–0.8 mm., and nearly all the rest have still longer styles (up to 1.1 mm.). Only one plant out of 30 has a style-length between 0.5 and 0.7 mm. In var. *glabrata* most of the plants measured have style-lengths of 0.7–0.8 mm., but one plant has styles 1.1–1.4 mm. long. The total number of plants of this variety that we have seen is too small to give a clear picture of their variability in this feature. European *R. islandica* is very variable in this respect, but we have not measured enough plants to get any reliable statistics. The style-length in the dozen that we have seen varies from 0.25–0.80 mm. with a mean of 0.55 mm. and no particular evidence of dimorphism.

Shape of the Style: There seems to be a slight difference in this respect in the several varieties, but it is a little difficult to express in any quantitative fashion.

Shape of the Stigma: In European *R. islandica* the stigma is distinctly capitate, usually nearly 0.1 mm. wider than the upper end of the style. Judging from Busch's figures the same is true of the Siberian specimens.[1] In var. *Fernaldiana* the stigma is usually subcapitate, but less widened than in the European plant. In var. *hispida* and var. *glabrata* the stigma is about the same width as the top of the style, or often a trifle narrower.

Seed Characters: The surface of the seed is the same in all varieties. The shape and size vary a little, but scarcely significantly. The following table summarizes the dimensions as we have ascertained them:

	No. specs. m's'd	Seed length (mm.)		Seed width (mm.)	
		Average	Extremes	Average	Extremes
European R. islandica	9	0.58	0.5–0.7	0.47	0.40–0.55
var. Fernaldiana	34	0.52	0.4–0.6	0.44	0.35–0.45
var. hispida	23	0.60	0.5–0.7	0.44	0.35–0.50
var. glabrata	8	0.70	0.6–0.9	0.50	0.40–0.70

It is to be noted that in var. *hispida* and var. *glabrata* the seeds are somewhat longer in proportion to their width than in the other

[1] N. Busch, loc. cit. p. 202. It is notable that the only one of Busch's figures (fig. 5) which does not show the capitate style comes from South America! The others are all Siberian.

varieties, and in var. *glabrata* the seeds are distinctly larger than any of the others. These larger seeds are also more rounded in outline and less angular than those seen elsewhere in the species, but the difference is not very clear-cut.

All of these points seem to be of a "more or less" type, and therefore to indicate varietal rather than specific differences. The other differences noted by Fernald are wholly vegetative (shape, cutting, and texture of leaves and size of plant), occasional exceptions occur as noted above, and the vegetative characters do not always correlate with the reproductive ones. We are therefore inclined to feel that the differences between European *R. islandica* and the ordinary American forms are of the same order of magnitude as those between the various American forms and that the most satisfactory tentative treatment is that of Marie-Victorin—to regard all the major variants as varieties of a single polymorphic world-wide species.

DRABA APRICA IN THE OZARKS OF SOUTHEASTERN MISSOURI

JULIAN A. STEYERMARK

WHEN Dr. Fernald revised *Draba* in Temperate Northeastern America,[1] the question arose as to whether *Draba brachycarpa* Nutt. var. *fastigiata* Nutt. should be included as a synonym under *D. aprica* Beadle. Specimens of this rare species had been collected by Beadle on Kenesaw Mountain, Georgia, in 1901, and again by Dr. Perry and Mr. Myers in 1934. Nuttall's type of *D. brachycarpa* var. *fastigiata* supposedly came from Arkansas, but there was some doubt as to whether his specimens actually came from Arkansas or from Georgia, because plants of *D. brachycarpa* from localities in Georgia were present on the same sheet as were the specimens collected by Nuttall. In view of such circumstances, the likelihood of confusion of data was possible. Students of the Arkansas flora were, therefore, urged to watch for the possible occurrence of this species in that state.

In the spring of 1939, while collecting along the Black River, in Reynolds County, southeastern Missouri, in an area which is threatened to be flooded by the construction of a dam, the writer chanced upon a strange-looking *Draba* growing in low open rocky woods in a

[1] Fernald, M. L., Draba in Temperate Northeastern America. RHODORA **36**: 361–363. 1934.